

CLAIMS

1. An aircraft comprising an envelope that is inflatable with a lifting gas that is lighter than air and has, at least when inflated, curved upper and lower surfaces, a payload carrying means, and an aerodynamic lifting means operable to generate lift on the envelope by causing a vertical annular flow of air that further induces a flow of air over the respective incident curved upper or lower surface.
2. An aircraft according to claim 1 wherein the aerodynamic lifting means comprises a plurality of aerofoil blades mounted for rotation around a periphery of the envelope.
3. An aircraft according to claim 2, wherein the aerofoil blades are variable pitch blades, and blade pitch control means are provided for varying the pitch of the blades collectively to effect directional control of the resulting annular air flow.
4. An aircraft according to any one of claims 1 to 3, wherein thrust control units are attached to the envelope to provide directional thrust to the aircraft.
5. An aircraft according to any one of the preceding claims wherein the plan shape for the envelope is selected from a circular, oval, ogival or elliptical shape.
6. An aircraft according to claim 5, wherein the envelope is of circular shape when viewed in plan and the blades rotate about a vertical centre-line axis of the envelope.
7. An aircraft according to claim 5 or claim 6 wherein the envelope is of a lenticular shape when viewed in elevation.

8. An aircraft according to any one of the preceding Claims wherein the aerodynamic lift generator comprises a plurality of aerofoil blades equispaced around the perimeter of the envelope that rotate around the envelope.
9. An aircraft according to claim 8 wherein each of the blades is a low aspect ratio wing and is mounted on a torque tube retained for pivotal movement about its longitudinal axis in a rotatable rigid ring.
10. An aircraft according to claim 9 wherein the rigid ring is able to rotate on rollers held in sleepers that constitute a track way provided on the outer face of the stiffening ring of the envelope.
11. An aircraft according to Claim 9 or Claim 10 wherein the rigid ring accommodates a plurality of pinion gears, there being a pinion gear for each blade, and each blade is provided with a rack with which one of the pinion gears engages, so that rotation of the pinion gear 25 alters the pitch of the blade 20.
12. An aircraft according to Claim 11 wherein the pinion gears are interconnected by a flexible torsion shaft that is supported by bearings and universal joints around the rigid ring 22 to ensure synchronisation and collective movement of the pitch of the blades when the torsion shaft is rotated.
13. An aircraft according to claim 12 wherein the torsion shaft is driven at equispaced positions around the ring 22.

14. An aircraft according to any one of claims 8 to 13 wherein each blade and an associated torque tube is mounted on a carriage that is connected to adjacent carriages around the perimeter of the envelope to form a driven part of a linear electric motor that functions to propel the blades around the periphery of the envelope.
15. An aircraft according to any one of claims 1 to 7 wherein the aerodynamic generator comprises an electro-kinetic system in which air circulation over the respective incident curved upper or lower surfaces is created by electrostatic effects.
16. An aircraft according to any one of claims 1 to 7 wherein the aerodynamic lift generator comprises a plurality of air discharge nozzles through which pressurised air issues and induces air flow over the respective incident upper or lower surface of the envelope.
17. An aircraft according to any one of the preceding Claims wherein additional means are provided to induce air flow over the respective incident upper or lower surface of the envelope.
18. A lighter-than-air vehicle comprising; a structural ring member having attached around a perimeter thereof a first flexible gas impermeable membrane, a second flexible gas impermeable membrane, and a diaphragm that, at least temporarily, is located between the first and second membranes to define an upper chamber that is inflatable with a lifting gas bounded, at least in part, by the first membrane and the diaphragm, and a lower chamber bounded at least in part by the second membrane and the diaphragm, said diaphragm being either removable after the upper chamber is inflated with a lifting gas but prior to the first ascent of the vehicle, or having venting means for allowing the lifting gas in the upper chamber to expand and pass through the

diaphragm during ascent of the vehicle, thereby to allow the lifting gas to expand into the space bounded at least in part by the second membrane; and a payload capsule suspended from the structural ring member.

19. A vehicle according to claim 18, wherein the structural ring member is a hollow inflatable structure.
20. A vehicle according to claim 19, wherein the structural ring member is a hollow rigid structure.
21. A vehicle according to claim 19, wherein the structural ring member is a flexible structure.
22. A vehicle according to claim 21, wherein the structural ring member has internal bulkheads.
23. A vehicle according to any one of claims 18 to 22, wherein the first membrane forms a dome shape when inflated.
24. A vehicle according to any one of claims 18 to 23, wherein the second membrane is of a distended conical shape and is attached at an upper end around a circumference of the structural ring member.
25. A vehicle according to any one of claims 18 to 24, wherein the second membrane is provided with a lower ring member attached to a lower end of the second membrane.

26. A vehicle according to any one of claims 18 to 25 wherein a payload capsule suspension system is provided comprising tie members that extend in a radial direction from the structural ring member to an upper hub assembly, and a downwardly directed tie member that extends vertically from the upper hub assembly, and the payload capsule is connected to a lower support hub attached to the lower end of the downwardly directed tie member.
27. A vehicle according to claim 26, wherein the lower ring member is moveable vertically relative to the downwardly directed tie member.
28. A vehicle according to claim 27, wherein the payload capsule is attached to the lower ring member by way of retractable tension lines that urge the lower ring member towards the payload capsule.
29. A vehicle according to any one of claims 26 to 28, wherein a gaiter is provided between the lower ring member and the lower support limb to allow vertical movement of the lower ring relative to the lower support limb.
30. A vehicle according to any one claims 18 to 29 wherein the diaphragm is connected to the structural ring member by a joint that enables the diaphragm to be removed prior to the first ascent of the vehicle.
31. A vehicle according to any one of claims 18 to 30, wherein the diaphragm is provided with controlled venting means for allowing lifting gas from the upper chamber to expand and flow through the diaphragm into the lower chamber in a controlled manner.

32. A vehicle according to any one of claims 18 to 31, wherein propulsion means are connected to the structural ring member.
33. A vehicle according to any one of claims 18 to 32, wherein solar power panels are located on the upper membrane.
34. A vehicle according to any one of claims 18 to 33, wherein a mast is provided that projects upwardly from the upper membrane of the upper chamber.
35. A method of launching a vehicle constructed in accordance with any one of the preceding claims, the method comprising securing the vehicle to the ground by mooring lines inflating the upper chamber with a lifting gas that is lighter than air, evacuating the lower chamber to provide a volume for receiving expanded lifting gas from the upper chamber, and releasing the mooring lines.
36. A method according to claim 35, including the steps prior to inflating the upper chamber with the lifting gas of inflating the upper and lower chambers with pressurised air so as to raise the structural ring member and the upper chamber from the ground, and subsequently evacuating the upper chamber of air.